Amendments to the Specification

Please replace paragraph 0008 with the following amended paragraph 0008.

[0008] JP-2000-275478A discloses an optical fiber array constructed so as to solve the problems discussed above. Namely, the grooved portion 3a of the optical fiber array disclosed in this publication has an upwardly convex rear end part formed adjacent to the shoulder 9, so that a crest 5a of each of two adjacent two walls defining each V-shaped groove 5 is rounded to have a relatively smooth curvature, in the reaar end part of the V-shaped groove 5 close to the shoulder 9, as shown in Fig. 4.

Please replace paragraph 0012 with the following amended paragraph 0012.

[0012] The first object indicated above may be achieved according to the present invention, which provides an optical fiber array characterized by comprising (a) a substrate having a shoulder and including a grooved portion and a planar portion which are formed integrally with each other on respective opposite sides of the shoulder, (b) the grooved portion of the substrate having a plurality of grooves formed [in the grooved portion of the substrate] such that the plurality of grooves are arranged in parallel with each other and such that each of the plurality of grooves is defined by two side walls which form a predetermined angle therebetween, (c) a plurality of optical fibers partly accommodated within the plurality of grooves, respectively, and thereby positioned

on the grooved portion, the plurality of optical fibers being supported by the planar portion of the substrate, (d) a covering plate disposed on the grooved portion of the substrate, to force the optical fibers partly accommodated in the plurality of grooves of the grooved portion, onto the two side walls of each groove, to thereby position the optical fibers, and (e) adhesive layers formed so as to fill gaps between the optical fibers and the substrate and between the optical fibers and the covering plate, for integrally bonding the optical fibers to the substrate and the covering plate, and wherein the gaps consists of a gap having a transverse cross sectional surface area S1 and formed between each of the optical fibers and an upper surface of the grooved portion of the substrate, and a lower surface of the covering plate, and a gap having a transverse cross sectional surface area S2 and formed between the two side walls of each of the grooves of the substrate and each optical fiber, the transverse cross sectional surface areas S1 and S2 being determined to satisfy and inequality S1 > S2.

Please replace paragraph 0013 with the following amended paragraph 0013.

[0013] In essence, the optical fiber array of the present invention is constructed such that the transverse cross sectional area S1 of the gap between each optical fiber and the upper surface of the grooved portion of the substrate, and the lower surface of the covering plate, that is, of the upper gap located above each optical fiber is larger than the transverse cross sectional surface area S2 of the gap between the two side walls of each groove of the substrate and each

optical fiber, that is, of the lower gap located below each optical fiber.

Please replace paragraph 0018 with the following amended paragraph 0018.

[0018] Where each optical fiber in the present optical fiber array is V-shaped groove as described above, it is preferable that the angle formed between the two side walls of the V-shaped groove is gradually increased in a portion of the grooved portion of the substrate on the side of the shoulder, or a ~~depth~~ distance between a nominal level of the upper surface of the grooved portion and a bottom of the V-shaped groove is gradually increased in a portion of the grooved portion of the substrate on the side of the shoulder. In this arrangement, each optical fiber partly accommodated in the V-shaped groove is spaced apart from the two side walls of the V-shaped groove, in the portion of the grooved portion on the side of the shoulder, and is not in contact with the rear edge of the V-shaped groove located at the shoulder, so that the optical fiber is protected against damaging or breaking due to contact of the optical fiber with the rear edge.

Please replace paragraph 0019 with the following amended paragraph 0019.

[0019] The first object indicated above may also be achieved according to the present invention, which provides a substrate for an optical fiber array, ~~characterized by~~ comprising ~~(a)~~ a grooved portion for positioning a plurality of optical fibers, ~~and (b)~~ and wherein ~~a plurality of grooves formed in~~ the grooved portion has a plurality of grooves

formed such that the plurality of grooves are arranged in parallel with each other and such that each of the plurality of grooves is defined by two side walls which form therebetween an angle larger that 70° and smaller that 100°, the plurality of optical fibers being partly accommodated in the plurality of grooves, respectively, and thereby positioned on the grooved portion.

Please replace paragraph 0022 with the following amended paragraph 0022.

[0022] The second object indicated above may be achieved according to the present invention, which provides an optical fiber array ~~characterized by~~ comprising (a) a substrate having a shoulder and including a grooved portion and a planar portion which are formed integrally with each other on respective opposite sides of the shoulder, (b) the grooved portion of the substrate having a plurality of V-shaped grooves formed ~~in the grooved portion of the substrate~~ such that the plurality of V-shaped grooves are arranged in parallel with each other and such that each of the V-shaped grooves has a V-shape defined by two side walls which form ~~therebetween and angle with is~~ a predetermined angle therebetween, the angle being gradually increased in a portion of the grooved portion of the side of the substrate, in a direction toward the shoulder, (c) a plurality of optical fibers partly accommodated within the plurality of V-shaped grooves, respectively, and thereby positioned on the grooved portion, the plurality of optical fibers being supported by the planar portion of the substrate, (d) a covering plate disposed on the grooved portion of the substrate, to force the optical fibers partly accommodated in the plurality of grooves

of the grooved portion of the substrate, onto the two side walls of each V-shaped groove, to thereby position the optical fibers, and (e) adhesive layers formed so as to fill gaps between the optical fibers and the substrate and between the optical fibers and the covering plate, for integrally bonding the optical fibers to the substrate and covering plate.

Please replace paragraph 0025 with the following amended paragraph 0025.

[0025] The second object indicated above may also be achieved according to the present invention, which provides an optical fiber array ~~characterized by~~ comprising (a) a substrate having a shoulder and including a grooved portion and a planar portion which are formed integrally with each other on respective opposite sides of the shoulder, (b) the grooved portion of the substrate having a plurality of V-shaped grooves formed ~~in the grooved portion of the substrate~~ such that the plurality of V-shaped grooves are arranged in parallel with each other, such that each of the V-shaped grooves has a V-shaped, and such that a ~~depth~~ distance between a nominal level of the upper surface of the grooved portion and a bottom of the V-shaped groove is gradually increased ina portion of the grooved portion on the side of the substrate, ina direction toward the shoulder, (c) a plurality of optical fibers partly accommodated within the plurality of V-shaped grooves, respectively, and thereby positioned on the grooved portion, the plurality of optical fibers being supported by the planar portion of the substrate, (d) a covering plate disposed on the grooved portion of the substrate, to force the optical fibers partly accommodated in the plurality of grooves of the grooved portion of the substrate, onto two side walls

defining each V-shaped groove, to thereby position the optical fibers, and (e) adhesive layers formed so as to fill gaps between the optical fibers and the substrate and between the optical fibers and the covering plate, for integrally bonding the optical fibers to the substrate and the covering plate.

Please replace paragraph 0026 with the following amended paragraph 0026.

[0026] In the optical fiber array of this invention constructed as described above, the ~~depth~~ distance between the nominal level of the upper surface of the grooved portion and the bottom of each V-shaped groove is gradually increased in the portion of the grooved portion on the side of the shoulder, so that the configuration of the V-shaped groove in the rear portion of the grooved portion ending at the rear edge provided by the shoulder is gradually changed, and the optical fiber partly accommodated in the rear portion of the V-shaped groove is space apart from the two side walls and is not in contact with the rear edge at the shoulder.

Please replace paragraph 0028 with the following amended paragraph 0028.

[0028] The second object indicated above may also be achieved according to the present invention, which provides a substrate for an optical fiber array, ~~characterized by~~ comprising (a) a grooved portion for positioning a plurality of optical fibers, (b) a planar portion formed integrally with the grooved portion, with a shoulder being formed between the grooved and planar portions, the planar portion supporting the plurality of optical fibers positioned on the grooved portion,

and (c) a plurality of V-shaped grooves formed in the grooved portion of the substrate such that the plurality of V-shaped grooves are arranged in parallel with each other and such that each of the V-shaped grooves has a V-shape defined by two side walls which form therebetween an angle which is gradually increased in a portion of the grooved portion on the side of the substrate, in a direction toward the shoulder, the plurality of optical fibers being partly accommodated in the plurality of grooves, respectively, and thereby positioned on the grooved portion.

Please replace paragraph 0032 with the following amended paragraph 0032.

[0032] The second object indicated above may also be achieved according to the present invention, which provides a substrate for an optical fiber array, ~~characterized by~~ comprising (a) a grooved portion for positioning a plurality of optical fibers, (b) a planar portion formed integrally with the grooved portion, with a shoulder being formed between the grooved and planar portions, the planar portion supporting the plurality of optical fibers positioned on the grooved portion, and (c) a plurality of V-shaped grooves formed in the grooved portion of the substrate such that the plurality of V-shaped grooves are arranged in parallel with each other, such that each of the V-shaped grooves has a V-shape, and such that a ~~depth~~ distance between a nominal level of the upper surface of the grooved portion and a bottom of the V-shaped groove is gradually increased in a portion of the grooved portion on the side of the substrate, in a direction toward the shoulder, the plurality of optical fibers being partly accommodated in the

plurality of grooves, respectively, and thereby positioned on the grooved portion.

Please replace paragraph 0034 with the following amended paragraph 0034.

[0034] In one preferred form of the optical fiber array substrate of the present invention described above, the ~~depth~~ distance between the nominal level of the upper surface of the grooved portion and the bottom of each V-shaped groove described above is gradually increased in a portion of each V-shaped groove between a longitudinally intermediate part thereof and an end thereof on the side of the shoulder. In this case, the optical fiber is positioned with high stability by the portion of the V-shaped groove in which the ~~depth~~ above-identified distance is not changed.

Please replace paragraph 0040 with the following amended paragraph 0040.

[0040] On the grooved portion 3a of the substrate 3 constructed as described above, there are arranged non-covered end portions 10 of the plurality of optical fibers 2, which extend from their covered portions 2a, such that the non-covered end portions 10 are accommodated n the respective grooves 5, in parallel with each other with the predetermined pitch T. The optical fibers 2 the non-covered end portions 10 of which are accommodated in the respective grooves ~~50~~ 5 are supported at their covered portions 2a on the planar portion 3b of the substrate 3. Further, the non-covered end portions 10 of the optical fibers 2 accommodated in the grooves 5 are positioned in contact with the adjacent two side walls of the

grooves 5 and a retainer surface (lower surface) of the covering plate 4 placed on the grooved portion 3a.

Please replace paragraph 0044 with the following amended paragraph 0044.

[0044] In the manufacture of the optical fiber array 1 having this structural feature, the optical fibers 2 are fixed to the substrate 3 by forming the adhesive layers 6 described above, more specifically, by injecting an adhesive agent 11 for forming the adhesive layers 6 into each groove ~~11~~ 5 through a distal open end of the groove 5 located at the distal end of the substrate 3 (which open end is remote from the shoulder 9), as shown in Fig.5, so that owing to capillarity, the injected adhesive agent 11 fills the gap 7 located above the non-covered end portion 10 in each groove 5 and the gap 8 located below the gap 7. Since the transverse cross sectional surface area S2 of the gap 8 (hereinafter referred to s "lower gap") located below the non-covered end portion 10 is smaller that the transverse cross sectional surface area S1 of the gap 7 (hereinafter referred to as "upper gap") located above the non-covered end portion 10, the velocity at which the adhesive agent 11 is injected into the lower gap 8 is higher than the velocity at which the adhesive agent 11 is injected into the upper gap 7. As a result, the adhesive agent 11 injected into the lower gap 8 reaches the rear open end of the groove 5 before the adhesive agent 11 injected into the upper gap 7 reaches the rear open end. After the lower gap 8 is filled with the adhesive agent 11, the upper gap 7 is filled with the adhesive agent 11.

Please replace paragraph 0045 with the following amended paragraph 0045.

[0045] Accordingly, the optical fiber array 1 according to the present embodiment is advantageously arranged to avoid trapping or presence of air P in the gap 8 (as shown in Fig. 3) between the non-covered end portion 10 of the optical fiber 2 accommodated in each groove 5 and the two side surfaces of the groove 5, during formation of the adhesive layers 6, that is, due to a ~~variation in the velocity~~ difference between the velocities of injection of the adhesive agent 11 into the ~~grooves 5~~ upper gap 7 and the lower gap 8 in the step of fixing the optical fibers 2 to the substrate 3. In the absence of the air P in the gap 8, the present optical fiber array 1 is effectively protected against reduction in the force of bonding of the optical fibers 2 to the substrate 3, which gives rise to a risk of removal of the optical fibers 2 from the substrate 3, bending or straining of the optical fibers 2 due to thermal expansion and contraction of the air P, which causes an increase in optical transmission loss of the optical fiber.

Please replace paragraph 0046 with the following amended paragraph 0046.

[0046] A relationship between the transverse cross sectional surface areas S1 and S2 of the gap 7 and the gap 8, which is the advantageous structural feature of the present embodiment, changes depending upon an outside diameter "d" of the non-covered end portion 10 of the optical fiber 2, the spacing pitch T of the optical fibers 2, the angle Θ between

the two side surface of the groove 5, and the shape of the groove 5, which are indicated in ~~Fig.1A~~ Fig.1B.

Please replace paragraph 0056 with the following amended paragraph 0056.

[0056] As is apparent from Figs. 9 and 10, the V-shaped grooves 5 are formed in the grooved portion 3a fo the substrate 3 for optical fiber array in the present embodiment, such that the angle ~~θ1, θ2, θ3~~ θ of each V-shaped groove 5 is gradually and smoothly increased in a direction toward the shoulder 9 at the rear end of the grooved portion 3a, and such that a ~~depth H from~~ distance H between the nominal upper surface level of the grooved portion 3a as measured at its longitudinally intermediate part ~~to~~ and the bottom of the V-shaped groove 5 is held constant over the entire length of the V-shaped groove 5.

Please replace paragraph 0057 with the following amended paragraph 0057.

[0057] In this embodiment of Figs. 9 and 10 wherein the distance between the adjacent V-shaped grooves 5 is determined to minimize the spacing pitch (T) of the non-covered end portions 10 (not shown) accommodated in the respective V-shaped grooves 5, the crests 5a are sharpened so as to gradually reduce the depth of each V-shaped groove 5 between its crest 5a and the bottom. Where the spacing pitch (t) of the non-covered end portions (10) is relatively large, and the crests 5a have flat end faces, on the other hand, the flat end faces of the crests 5a are gradually narrowed at the near end part of the groove 5, like a widthwise end section 5b

of the grooved portion 3a of the substrate 3, as indicated in Fig. 9. Further, the ~~depth H from~~ distance H between the nominal upper surface level of the grooved portion 3a as measured at its longitudinally intermediate part ~~to~~ and the bottom of the V-shaped groove 5 may be changed in the longitudinal direction of the V-shaped groove 5.

Please replace paragraph 0062 with the following amended paragraph 0062.

[0062] In the present substrate 3 for optical fiber array, the configuration of a part of the grooved portion 3a which is near the shoulder 9 is gradually changed so as to reduce the amount of stress concentration on the non-covered end portions (10) of the optical fibers (2) due to the adhesive layer (6) formed on the planar portion 3b, making it possible to prevent an increase in the optical transmission loss of the optical fibers (2).

Please replace paragraph 0064 with the following amended paragraph 0064.

[0064] Referring to Figs. 11 and 12, there is schematically illustrated another example of the substrate 3 for optical fiber array of the optical fiber array 1 according to the present invention. As is apparent from Figs. 11 and 12, the V-shaped grooves 5 are formed in the substrate 3 for optical fiber array in the present embodiment, such that ~~a depth H1, H2, H3 from~~ a distance H between the nominal upper surface level of the grooved portion 3a as measured at its longitudinally intermediate part ~~to~~ and the bottom of the V-shaped grooves 5 is gradually and smoothly increased in a

direction toward the shoulder 9 at the rear end of the grooved portion 3a, as indicated at H1, H2, and H3 by way of example in Fig. 12, and such that the angle θ of the V-shaped grooves 5 is held constant over the entire length of the V-shaped groove 5.

Please replace paragraph 0065 with the following amended paragraph 0065.

[0065] In this embodiment wherein the distance between the adjacent V-shaped grooves is determined to minimize the spacing pitch (T) of the non-covered end portions 10 (not shown) accommodated in the respective V-shaped grooves 5, the crests 5a are sharpened so as to gradually reduce their height as the ~~depth from~~ distance H between the nominal upper surface level of the grooved portion 3a as measured at its longitudinally intermediate part ~~to~~ and the bottom of the V-shaped groove 5 is gradually increased, so that the depth of the V-shaped groove 5 from its crest 5a to its bottom is held constant over the entire length of the V-shaped groove 5. Where the spacing pitch (T) of the non-covered end portions (10) is relatively large, and the crests 5a have flat end faces, on the other hand, the flat end faces of the crests 5a are gradually narrowed at the rear end part of the groove 5, like the widthwise end section 5b of the grooved portion 3a of the substrate 3, as indicated in Fig. 11. Further, the angle of the V-shaped groove 5 may be changed as the ~~depth H from~~ distance H between the nominal upper surface level of the grooved portion 3a as measured at its longitudinally intermediate part ~~to~~ and the bottom of the V-shaped groove 5 is gradually increased.

Please replace paragraph 0066 with the following amended paragraph 0066.

[0066] In the substrate 3 for optical fiber array according to the present embodiment, the ~~depth H from~~ distance H between the nominal upper surface level of the grooved portion 3a as measured at its longitudinally intermediate part ~~to~~ and the bottom of the V-shaped groove 5 is gradually increased in the rear portion of the length of the grooves 5 from the longitudinally intermediate position to the rear end defined by the shoulder 9, and is held constant at H1 in the other front portion which is remote from the shoulder 9. This arrangement permits stable positioning of each optical fiber 2 within the front portion of the V-shaped groove 5 in which the ~~depth H from~~ distance H between the nominal upper surface level of the grooved portion as measured 3a at its longitudinally intermediate part ~~to~~ and the bottom of the V-shaped groove 5 is held constant.

Please replace paragraph 0070 with the following amended paragraph 0070.

[0070] In the present substrate 3 for optical fiber array, the configuration of a part of the grooved portion 3a which is near the shoulder 9 is gradually changed so as to reduce the amount of stress concentration on the non-covered end portions (10) of the optical fibers (2) due to the adhesive layer (6) formed on the planar portion 3b, making it possible to prevent an increase in the optical transmission loss of the optical fibers (2).

Please replace paragraph 0072 with the following amended paragraph 0072.

[0072] The optical fiber array may be constructed so as to employ a combination of the structural feature shown in Figs. 9 and 10 and the structural feature shown in Figs. 11 and 12. That is, the optical fiber array may be constructed such that the angle θ of each V-shaped groove 5 is gradually increased in the rear portion of the grooved portion 3a on the side of the shoulder 9 while at the same time the ~~depth H from~~ distance H between the nominal upper surface level of the grooved portion 3a as measured at its longitudinally intermediate part ~~to~~ and the bottom of the V-shaped groove 5 is gradually increased in the rear portion of the grooved portion 3a on the side of the shoulder 9. Although the configuration of the V-shaped groove 5 is more or less complicated in this modified arrangement, this modification enjoys the same advantages as the preceding embodiments.